

tutes, and art schools. In thirty-six London County Council schools, centres for instruction in commercial and science and art subjects will be opened. These centres are in a degree contributory to the polytechnics and technical institutes mentioned above and are primarily intended for students not sufficiently advanced for the polytechnic classes. Advanced work, however, is taken in many of the subjects. In 237 London County Council school buildings situated in every part of London, ordinary evening schools will be opened this session. The instruction will, as a rule, be of a character preparatory to that given in the centres.

THE educational demands of the organised workers of this country are expressed in the following points of a resolution adopted at the Trade Union Congress at Bath last week:—(1) The State maintenance of school children. (2) Scientific physical education with individual medical inspection, and records of the physical development of all children attending State schools, and skilled medical attendance for any requiring it, and in order to secure this:—(a) The formation of a properly staffed medical department at the Board of Education, the head of which shall be directly responsible to the Minister of Education, to whom he shall report annually. (b) The payment of an adequate grant from the Imperial Exchequer for purposes of medical inspection. (c) The establishment under every education authority of scientifically organised open-air recovery schools, the cost to be borne by the community as a whole, and not in any part by charitable contributions. (3) The complete dissociation of reforms (1) and (2) from Poor Law administration. (4) A national system of education under full popular control, free and secular from the primary school to the university. (5) That secondary and technical education be an essential part of every child's education, and secured by such a reform and extension of the scholarship system as will place a maintenance scholarship within the reach of every child, and thus make it possible for all children to be full-time day pupils up to the age of sixteen. (6) That the best intellectual and technical training be provided for the teachers of the children, that each educational district shall be required to train the number of pupil teachers demanded by local needs, and to establish training colleges, preferably in connection with universities or university colleges. (7) That the provision of educational buildings and facilities be obligatory upon the local authority, who shall always retain administrative control of the buildings and facilities so provided. (8) That the cost of education shall be met by grants from the Imperial Exchequer, and by the restoration of misappropriated educational endowments. (9) That it be an instruction to the Parliamentary Committee of the Trade Union Congress to formulate these proposals in a Bill to be laid before Parliament during the forthcoming session.

FROM tables published in *Science* of August 30, it appears that the total number of degrees of doctor of philosophy and doctor of science conferred by the universities of the United States this year was 327, which is almost exactly the same as in 1905 and 1906, when the numbers were, respectively, 325 and 326. The average number for the past ten years is 271. Of 2715 doctorate degrees conferred during the past ten years, 1232, somewhat less than half, have been in the natural and exact sciences. The relative proportion of degrees in the humanities and in the sciences has not altered appreciably in the ten years covered by the statistics. The Johns Hopkins has conferred more degrees in the sciences than any other institution, but is closely followed by Chicago, and at a not very considerable distance by Harvard, Columbia, and Yale. Fifty-five per cent. of the degrees conferred at the Johns Hopkins have been in the sciences, and 57 per cent. at Cornell, whereas in the other leading institutions the percentage is decidedly less—46 at Chicago, 42 at Harvard and Columbia, and 40 at Yale and Pennsylvania. Of the 1232 degrees conferred in the sciences during the past ten years, chemistry leads with 320 doctorates; then follow in order of numbers, physics, 155; zoology, 147; psychology, 134; botany, 126; and mathematics, 121. The remainder of the degrees are divided among fourteen other sciences, meteorology and geography being at the bottom of the list with one doctorate each.

## SOCIETIES AND ACADEMIES.

LONDON.

**Royal Society.** June 27.—“On the Force required to Stop a Moving Electrified Sphere.” By G. F. C. Searle, F.R.S.

If  $F$  be the force which must be applied to the sphere at any time  $t$ , after it has been brought to rest at  $t=0$ , the positive direction of  $F$  being opposite to that of  $u$ , the initial velocity, the momentum given up by the electromagnetic field from  $t=0$  to  $t=t$  is

$$\int_0^t F dt.$$

During this period the force  $F$  does no work, since the sphere is at rest, and hence the energy is unchanged during this period.

At the time  $t$  let the sphere be restarted with the same velocity  $u$  without change of direction, and let  $G$  be the force which must be applied to the sphere at any subsequent time in the direction of  $u$  in order to maintain the velocity  $u$ . This force lasts from  $t=t$  to  $t=t'$ , where  $t'-t$  is determined by the condition that in the time  $t'-t$  the pulse formed on restarting the system has completely passed over the sphere. During the interval  $t'-t$ , the momentum is increased by

$$\int_t^{t'} G dt,$$

and hence the total gain of momentum is

$$\int_t^{t'} G dt - \int_0^t F dt.$$

During the interval  $t'-t$ , the energy has been increased by

$$u \int_t^{t'} G dt.$$

The stopping and the restarting of the sphere each give rise to a pulse, and the compound pulse so formed carries off energy  $W'$  and momentum  $P'$ . Before the system was stopped the energy of the electromagnetic field was  $U+T$  and its momentum was  $M$ , and at an infinite time after the stopping and restarting the energy is  $U+T+W'$  and the momentum is  $M+P'$ , since the energy and momentum in the parts of the field outside the compound pulse ultimately vanish.

Equating the two expressions for the gain of momentum, we have

$$\int_t^{t'} G dt - \int_0^t F dt = P'.$$

Similarly,

$$u \int_t^{t'} G dt = W'.$$

Hence

$$\int_0^t F dt = W'/u - P', \quad (1)$$

and thus we find that the force required to stop the system is given by

$$F = \frac{d}{dt} \left( \frac{W'}{u} - P' \right). \quad (2)$$

This force will become zero as soon as  $W'/u - P'$  becomes constant, which will occur as soon as  $t$  is so great that the two pulses due to the stopping and restarting do not overlap.

It follows from (2) that, if  $F_0$  be the force required to stop a sphere of radius  $a$  with a uniform surface-charge  $Q$ ,

$$F_0 = \frac{Q^2}{2Ka^2} \left( \frac{v}{u} - \frac{v^2 - u^2}{2u^2} \log \frac{v+u}{v-u} \right),$$

where  $v$  is the velocity of light. When the sphere has a uniform volume-charge

$$F = \frac{3}{8} a^{-4} (16a^3 vt - 12a^2 v^2 t^2 + v^4 t^4) F_0.$$

PARIS.

**Academy of Sciences.** September 2.—M. A. Chauveau in the chair.—Caryolysis in the nidorian glands of *Genetta senegalensis*: Joannes Chatin. A study of nuclear degeneration in the peripheal glands. It is shown that this is a form of true caryolysis, exactly corresponding to the disappearance of the nucleus in the true sebaceous cell.—Physically similar fluids: M. Jouguet.—The action

of gravity on the deposit of induced radio-activity: Mme. **Curie**. Metallic plates were submitted to the action of a fixed amount of emanation for a fixed time, and the induced radio-activity measured. The results obtained were as if the induced radio-activity suspended in the gas surrounding the plates behaved as solid particles, possessing weight, and falling through the gas. The activity of plates turned towards the top of the vessel was always greater (two to five times) than that of those turned towards the bottom or hanging vertically. The presence of a gas was found to be indispensable to this phenomenon, the effects not being observed when the pressure was reduced below 2 cm. of mercury. The presence of water vapour was also a necessary condition.—The radio-activity of uranyl molybdate: **B. Szilárd**. In a recent note M. Lancien stated that he had prepared a uranyl molybdate the activity of which was much higher than that of the original uranyl nitrate. In all previous researches on the subject the activity of uranium preparations has always been found proportional to the amount of uranium present in the salt, and less than that of pure uranium. The author has therefore repeated the experiment of M. Lancien, preparing the molybdate in the same manner, but with opposite results. The activity found was about 0.3 that of metallic uranium, a normal figure for the amount of uranium present in the salt.—The effect of metallic wire screens on the secondary radiation of induced radio-activity: **Ed. Sarasin** and **Th. Tommasina**.—*Cyperus tuberosus* in the auriferous strata of Madagascar: **H. Jumelle** and **H. Perrier de la Bathie**.—Intra-organic oxidation and the electric charge of leucocytes as important agents of immunisation: **Alexandre de Poehl**.—The relation which exists between the distribution of petroleum-bearing regions and the distribution of seismic zones: **L. C. Tassart**. A comparison of the seismic maps of M. de Montessus de Ballore and the map of the petroleum-bearing regions of B. Redwood shows that all the petroleum deposits which are found in relatively recent strata are situated in the maximum seismic zones or in their immediate vicinity. In these seismic zones there may be petroleum deposits in relatively ancient strata, but this is exceptional. Petroleum deposits which are found outside the seismic zones are situated in ancient strata, and in regions which at some time or other have been the seat of important seismic disturbances.

#### NEW SOUTH WALES.

**Royal Society**, June 5.—**Mr. H. Deane**, president, in the chair.—Some peculiarities in our coastal winds and their influence upon the abundance of fish in inshore waters: **H. C. Dannevig**. Careful comparison between the catches of fish in certain coastal waters and the number of men employed has shown that the average catch per man at each locality is greater in some years than others. Also it is apparent that this fluctuation in abundance of fish is uniform all along the coast; thus in 1898 there was a general scarcity of fish; each man then captured less than during previous and succeeding years. This was followed by a gradual increase until 1901, when a climax was reached; a gradual decrease in the catches followed, until in 1905, when the results were as poor as in 1898. Last year shows a tendency to improvement. These periodic increases and decreases in the abundance of fish all along the coast at the same time are not traceable to the action of the fishermen, but can alone be due to certain climatic changes. A careful examination of the wind records from this coast for the last twenty-four years has furnished important evidence in explanation; it is this: by measuring the winds' influence by the number of inches they blow from each point during a twelvemonth, it is found that almost every year the atmosphere is on this coast pushed northwards to the extent of many thousands of miles, and not in the opposite direction as usually thought. But this northerly movement—or the yearly dominating wind—as the resultant may be called, does not invariably follow the same direction; it has an easterly or westerly tendency or direction from the normal in different years. This difference in the direction of the yearly wind-force has a corresponding influence upon the coastal current; the latter flows normally along the coast in a southerly direction, and is pushed on to the land or away from it according to

circumstances. The current carries the bulk of our floating fish eggs, and these, therefore, are some years kept close inshore and at other times carried out to sea, in which case they are lost to us. Year after year there are good hatching seasons and bad ones, and in a number of years afterwards there ought to be correspondingly plenty of fish or scarcity. This is the case: most of our market supplies consist of four years old fish—the average of maturity—and by comparing the periodic deviations of the winds on to the coast and away from it with the richness of the catch of fish per man four years afterwards, a very striking correspondence is found. This comparison has been made over a period of ten years, and in no case is there any important discord, so it would seem that a very interesting and also important answer has been found to the otherwise inexplicable fluctuation in abundance of fish. It follows that as this year's winds control the abundance of fish four years hence, it may be possible some day to make a fairly accurate forecast as to what the next succeeding years will bring.

July 3.—**Prof. Liversidge**, F.R.S., in the chair.—Note on action of nitric acid in neutralising alkaline soil: **R. S. Symmonds**. Culture-pots were filled with alkaline soil and treated with various proportions of nitric acid. Seeds of wheat were sown in these and in pots containing untreated soil. Photographs of the plants were taken, and show an enormously increased growth, due to the neutralisation of the sodium carbonate and its conversion into sodium nitrate. A further series of experiments is being carried out on a large scale, which will form the subject of a future communication. The author discusses the possibility of the manufacture of the required nitric acid on the spot from the atmosphere by utilising the power derivable from the pressure given in the outflow from the artesian bores.

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